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Cultivating communication through PBL with ICT

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Abstract

Communication plays an essential role in the Biology education. It focuses on delivery and transmission of knowledge. In problem-based learning (PBL), communication is seen as a fundamental skill that has to be developed and used by the students. During the PBL sessions, students are required to read out the problems, gather feedback from their peers, find a solution and lastly do a group presentation. All this steps require communication skills throughout the PBL process. Quasi experiment with the non-equivalent control group design was used for this study. The research design is non-equivalent control group design with posttest only. There were two experimental groups and one control group involved in the study. The first experimental group was exposed with PBL with ICT treatment whilst the second experimental group was exposed with PBL treatment. Meanwhile the control group was exposed with the conventional teaching method. Eighty samples were involved in the study. Communication skills were measured using a rubric at the end of the treatment. The data was analyzed using quantitative measure which is mainly ANOVA. Findings showed that the PBL with ICT group had the highest score in communication skills. The implications of the study suggested that an integration of ICT in PBL is seen effective in cultivating communication skills for higher education.

Keywords: Problem-based learning; ICT, Communication skills

1. Introduction

Biology education in the higher learning in Malaysia has undergone a transformation in the recent years. The full lecture based sessions are now replaced with student centered teaching methodologies. This is in line with the recommendation from Ministry of Higher Education Malaysia (2004) that is to teach enough factual knowledge and practical skills, and more importantly, to also encourage students to be inquiring, to critically appraise problems, evaluate and offer creative solutions as well as to develop in them a sense of professionalism and attitudes that are desirable for the Malaysian society. Teaching of Biology now focuses on development of knowledge, practical skills and generic skills. Thus it is important to find an approach that covers all these areas.

Typical lecture-based instruction occurs exclusively in a full-class rather than the small group context; the instructional method, by definition is prohibitive of small group interaction during class (Kelly et al. 2004; Turan, 2010). During the classroom sessions, the lecturer does most of the teaching and the students listen passively. This involves a one-way communication most of the time. The students are not actively involved in communicating with their lecturer and peers. PBL could be used as an alternative to teach Biology. PBL is a non-traditional method that encourages construction of knowledge and communication skills on the part of the learner. Over the years problem-based learning (PBL) has shown the potential of developing knowledge and generic skills. PBL has been adopted by many lecturers to teach Biology. PBL emphasizes transferable skills development alongside disciplinary content coverage and therefore, is one approach to satisfying the multiple demands now made of undergraduate education (Mitchell et al. 2010). Communication skills is an important element in PBL as lots of teamwork is involved. It

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involves peer interaction in order to find information and solution and is important during the writing and presentation process. Numerous researches have reported that PBL improves the communication skill of students (Riberio 2008; Lai 2007; Özdamlı, 2009).

2. Aim of Study

The aim of the research is to study effectiveness of integrating ICT into PBL in Biology towards students' oral group communication skills.

3. Research Question

To examine the effect of PBL with ICT in Biology towards students' oral group communication skills.

4. Research Design

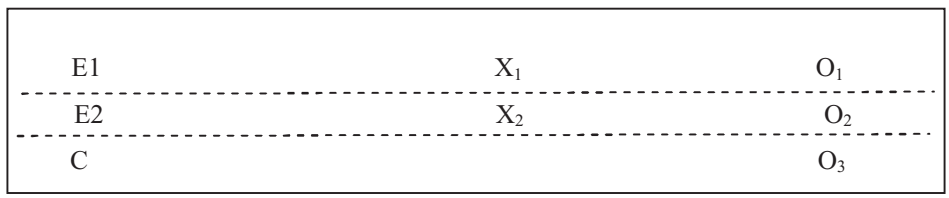

Figure 1 The Non-Equivalent Control Group Design with Posttest Only

Representations of symbols:
E1 : First experimental treatment group
E2 : Second experimental treatment group
C : Control group
X_1 : PBL with ICT
X_2 : PBL
O_1, O_2, O_3 : Posttest

The research design is called the posttest-only design with non-equivalent control group (Cook & Campbell 1979). There are three groups present in this design namely: PBL with ICT group, PBL group and control group. Posttest is employed at the end of the treatment. Subsequently the oral group communication skills were measured using a rubric adapted from Barnett (2006). At the end of each session, students were required to do presentation in their respective groups. Thus a rubric was used to assess the presentation.

5. Instruments

To measure the oral group communication skills, there were three types of instruments used in this study. They are as the following: PBL integrated with ICT module, PBL module, four PBL cases and communication skill rubric. Both the modules consisted of six phases. These modules had previously undergone an action research design and have been validated by PBL experts (Simranjeet et al. 2009). At the fifth phase, both the groups were required to do presentation on the solution of each PBL case given to them. The PBL group used a poster as a mode of presentation, whilst the other group presented using Microsoft Power Point. In order to measure the oral communication skill, a rubric was utilized. This rubric was given to the samples prior to the PBL sessions. The group oral presentation rubric was adapted from Barnett (2006). Originally it was used to assess the oral group communication skills of upper-level college students.

The oral group communication skill was assessed during group presentations. For this study there were four PBL cases involved. Thus the performance between both the PBL groups was measured through the seven criteria allocated in the rubric. The first PBL case presentation focused in the solution to the cause of flat bread. PBL with ICT group had the highest mean followed by the PBL and control group. Levene test was carried out to test the homogeneity of the groups. It was found that ($p>0.05$) for mean score organization criteria, Style-Verbal Delivery criteria, Style-Non-Verbal Delivery criteria, Content criteria, Group Interactions criteria, Use of Aids criteria and overall. While ($p<0.05$) for the mean score Oral Language Conventions criteria. Overall the case one results showed that the samples were from the same population. The ANOVA results revealed a significant difference at an alpha level of 0.05 among the group, $F(2, 13) = 4.583$, $p=0.031$. A post hoc Bonferroni test was also further used to analyze the significant difference in the overall mean score for case one. It was found that there was no significant difference between all the groups. The post hoc Bonferroni test was further used to analyze the significance of seven criteria in the oral group communication skills rubric. The results showed that there was no significant difference between all the groups for the seven criteria.

During the second case presentation, samples were required to present a zoo plan which included the arrangement of species according to their habitat. PBL with ICT group had the highest mean followed by the PBL and control group. Levene test was carried out to test the homogeneity of the groups. It was found that ($p>0.05$) for mean score organization criteria, Style-Verbal Delivery criteria, Style-Non-Verbal Delivery criteria, Content criteria, Group Interactions criteria, Use of Aids criteria and overall. While ($p<0.05$) for the mean score Oral Language Conventions criteria. Overall the case two results showed that the samples were from the same population. The ANOVA results revealed a significant difference at an alpha level of 0.05 among the group, $F(2, 13) = 7.634$, $p=0.006$. A post hoc Bonferroni test was also further used to analyze the significant difference in the overall mean score for case two. It was found that there was no significant difference between all the groups. The post hoc Bonferroni test was further used to analyze the significance of seven criteria in the oral group communication skills rubric. The results showed that there was no significant difference between all the groups for the seven criteria.

In the third case, students were required to make a decision whether the park in their town should be maintained or instead a theme should be built on the same site. Overall the PBL with ICT group achieved the highest score followed by the PBL group and control group. Levene test was carried out to test the homogeneity of the groups. It was found that ($p>0.05$) for mean score organization criteria, Style-Verbal Delivery criteria, Content criteria, Oral Language Conventions criteria, Group Interactions criteria, Use of Aids criteria and overall. While ($p<0.05$) for the Style-Non-Verbal Delivery criteria mean score. Overall the case three results showed that the samples were from the same population. The ANOVA results revealed a significant difference at an alpha level of 0.05 among the group, $F(2, 13) = 17.285$, $p=0.000$. A post hoc Bonferroni test was also further used to analyze the significant difference in the overall mean score for case three. It was found that there was a significant difference between PBL with ICT and PBL group; ICT and control group. There was no significant difference between PBL group and control group. The post hoc Bonferroni test was further used to analyze the significance of seven criteria in the oral group communication skills rubric. The results showed that there was no significant difference between all the groups for the organization criteria. There was no significant difference for the style: verbal delivery criteria for all the groups. Meanwhile there was a significant difference for style: non-verbal delivery criteria for PBL with ICT group and control group. There was no significant difference observed for PBL with ICT group and PBL group; PBL and control group. For the last four criteria namely: content, oral language convention, group interaction and use of aids, there was no significant difference between all the groups.

The last case was about saving the sea after there was a massive oil spill caused by a collision between an oil tanker and a ship. The PBL with ICT group once again achieved higher scores compared to the other group in all the criteria. Levene test was carried out to test the homogeneity of the groups. It was found that ($p>0.05$) for mean score for all the scales and overall. Overall the case four results showed that the samples were from the same population. The ANOVA results revealed a significant difference at an alpha level of 0.05 among the group, $F(2, 13) = 15.947$, $p=0.000$. A post hoc Bonferroni test was also further used to analyze the significant difference in the overall mean score for case four. It was found that there was a significant difference between PBL with ICT group and control group. There was no significant difference between PBL with ICT group and PBL group; PBL group and control group. The post hoc Bonferroni test was further used to analyze the significance of seven criteria in the oral group communication skills rubric. The results showed that there was a significant difference between PBL with ICT group and control group; PBL and control group for the organization criteria. There was no significance difference between the PBL with ICT group and PBL group. In the style: verbal delivery criteria, there was no significance

observed between all groups. Meanwhile there was a significant difference for style: non-verbal delivery criteria for PBL with ICT group and control group. There was no significant difference observed for PBL with ICT group and PBL group; PBL and control group. Content criteria reported a significant difference for PBL with ICT group and control group. There was no significant difference observed for PBL with ICT group and PBL group; PBL and control group. For the last three criteria namely: oral language convention, group interaction and use of aids, there was no significant difference between all the groups.

7. Discussion

Overall the findings supported that the PBL with ICT group was significant compared to the PBL group and control group. The mean score for the PBL with ICT group was significantly higher than the PBL and control group in all the four cases. In case three and case four, ANOVA results showed a significant difference between groups. For case three there was a significant difference between the following pairs: PBL with ICT group and PBL group; PBL with ICT group and control group. Nevertheless in case four there was only one significant difference between groups in PBL with ICT group and control group.

A research was conducted on a third year, Communication Systems II Module (Mitchell et al. 2010). PBL was implemented in this module. Based on the staff's observation, students enhanced their communication skills by engaging in the PBL process. Previously this course was taught using the lecture method. By switching to PBL, students were required to form groups and solve the problems given by their tutors. The success of group process depends on small decision making, which in turn is influenced by communication skills and interpersonal skills of group members (Uden & Beaumont 2006). Overall students developed their communication skills while undergoing the PBL process. The oral group communication skills of the PBL group and PBL with ICT group were far better than the lecture group. Another research with PBL with ICT was examined. The research was based on assessment on the online doctoral nursing course using PBL was conducted (Candela et al. 2009). Students assumed their roles as chairperson and faculty to assess topics that had been assigned using PBL. Meetings, discussion and summary were done using an online discussion board. Based on instructor evaluation, the students were highly involved in meetings and providing solid facts to back their arguments. Based on a survey, the students provided feedback: teamwork, goal orientation, communication and problem solving received high ratings. Overall the online discussions provided students with a ground to meet up and discuss issues pertaining to their assignments. The setting was quite similar to the PBL with ICT group with the electronic discussion group. However due to the students' level in Foundation, online was not found practical as at this level it was important to monitor students on ground and provide scaffolding to aid them at the beginning of the sessions. Nevertheless, the oral communication improved due to the presence of ICT in the online doctoral course and the Foundation course.

8. Conclusion

Overall the PBL integrated with ICT group achieved the highest scores in their oral communication skill in all the four PBL cases. The ICT element helped in improving the oral group communication skills as students were more confident, organized and prepared for the presentation at the end of each case.

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